Dental and Cranial Anomalies in the River Otter (Carnivora: Mustelidae)

THOMAS D. BEAVER, GEORGE A. FELDHAMER AND JOSEPH A. CHAPMAN

Appalachian Environmental Laboratory,
Gunter Hall, Frostburg State College Campus,
Frostburg, Maryland 21532

ABSTRACT.— Dental or cranial anomalies were noted in 65 (32.2%) of 202 skulls of river otters, *Lutra canadensis,* collected from the Chesapeake Bay region of Maryland and Virginia from 1974 to 1979. The most frequent anomaly was alveolar thinning. Anomalies probably did not adversely affect individuals or the population structure.

INTRODUCTION

The dentition and cranial structure of many mammalian species have been well studied because of their importance in systematics and taxonomy. Also, the condition of teeth affects nutritional status, which in turn directly affects behavior, reproduction and longevity (Robinson 1979). As a result, anomalies have been described for several orders and numerous mammalian species (Choate 1968; Colyer 1936; Hershkovitz 1970; LaVelle and Moore 1972; Manville 1963; Pavlinov 1975; Sheppe 1964; Shultz 1923). However, relatively few studies have dealt with the Mustelidae (Hall 1940; Heran 1970; Parmalee and Bogan 1977). Here we describe dental and cranial anomalies noted in skulls of river otters, *Lutra canadensis,* from the Chesapeake Bay region of Maryland and Virginia and assess their probable impact upon individuals and the population.

MATERIALS AND METHODS

A total of 202 skulls was collected from trappers in Dorchester County, Maryland, during the trapping seasons of 1974 through 1979. The material was considered a random sample representative of the river otter population as no skull was obtained specifically because it had an anomaly. All skulls were individually numbered and are housed in the museum collection of the Appalachian Environmental Laboratory (AEL). Each skull was examined for the following: 1) plagiocephaly — asymmetrical cranial growth due to premature closure of one frontal-parietal suture; 2) bregmatic bones — extra bones derived from accessory ossification in any of the fontanelles; 3) heterotopic bones — small accessory bones; 4) caries — decay of dental tissue; 5) alveolar thinning — exposure of the buccal tooth roots; 6) supernumerary teeth — those in excess of the normal dental pattern; 7) congenital agenesis

— reduced dental complement due to teeth that failed to develop; and 8) irregular placement —teeth in positions other than the normal pattern. Skulls were X-rayed to provide confirmation of suspected agenesis or supernumeration.

RESULTS AND DISCUSSION

A total of 137 skulls (67.8%) exhibited no cranial abnormalities or deviation from the normal dental pattern of 3/3, 1/1, 4/3, 1/2 = 36 in *L. canadensis*. Anomalies were found in 65 skulls (32.2%). This is similar to the results of Colyer (1936) who noted "marked irregularities" in 75 of 161 (46.6%) skulls of *Lutra* sp. — a greater percentage of occurrence of anomalies than in any other genus of Mustelidae he examined.

Cranial anomalies.— Cranial anomalies occurred in only 2 (1.0%) of the skulls examined. Plagiocephaly was found in an adult female over 3 years of age, and there was a small hole in the frontal bone (Fig. 1). Mowbray et al. (1979) indicated that 11% of the 296 river otter carcasses that they examined from this study area showed evidence of gunshot wounds, although few animals (1.7%) were judged to have died from such wounds. Dougherty and Hall (1955) and van Soest et al. (1972) noted that characteristics similar to those seen in Figure 1 may result from metastrongylid nematode *(Skrjabingylus* sp.) involvement. Thus, the plagiocephaly may have resulted from an extrinsic agent, either a nonlethal gunshot wound or a parasite, rather than genetic factors. Heterotopic bones occurred on the premaxilla of an adult male over 3 years of age (Fig. 2); there were no indications of previous injury. Whether this condition was genetic in origin or resulted from previous trauma could not be determined. No instances were found of bregmatic bones.

Dental anomalies.— Dental anomalies were much more prevalent than cranial anomalies. With the exception of caries, an example of each dental anomaly was represented in the sample. The lack of caries in wild animals is consistent with previous studies. Hall (1940) found caries in only 8 of 3,761 specimens (0.2%) of North American carnivores, and all cases occurred within the Ursidae. Colyer (1936) reported only 4 cases of caries in 7,635 specimens (0.05%) of North American carnivores. The reason for lack of caries in the river otter, as well as most other carnivores, is unknown, although it may be associated with absence of carbohydrates in the diet.

Irregular tooth placement was noted in two individuals: a juvenile female had teeth that were abnormally far apart (Fig. 3), and in an adult female they were exceedingly close together (Fig. 4).

Alveolar thinning (Fig. 5) was the most common anomaly, occurr ing in 47 skulls (23.3%). Of these, 39 (82.9%) involved the last upper

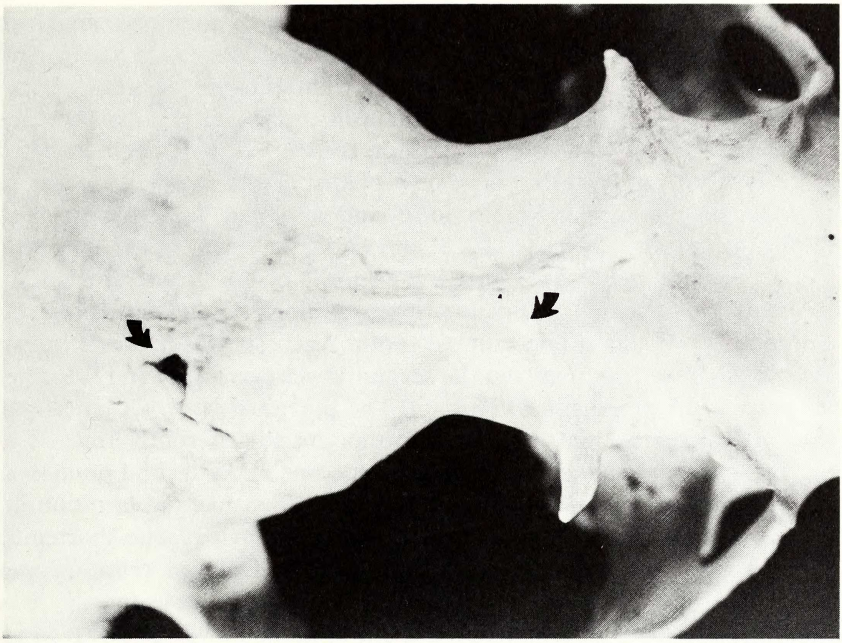

Fig. 1. Plagiocephaly in adult female river otter (AEL-302); also note small hole in frontal bone.

Fig. 2. Heterotopic bones in adult male river otter (AEL-303).

molar, and 7 others involved both upper and lower premolars in which thinning was associated with the posterior premolar in the tooth row. Smith et al. (1977) also found alveolar thinning associated "almost exclusively" with the last upper molars in three species of platyrrhine monkeys. They attributed the condition to internal pressures associated with mastication. Such thinning may predispose underlaying tissues to periodontal disease, and both local and systemic factors have been implicated in this process (Clark et al. 1970).

Congenital agenesis occurred in 8 (3.9%) of the skulls. Three additional skulls appeared to possess this condition, however X-ray roentgenograms revealed a non-erupted tooth. Agenesis was bilateral in two individuals; one case involved the second lower premolars and the other the second upper premolars (Fig. 6). The other six cases, all unilateral, involved two different locations in the maxillary tooth row: five instances occurred at the first premolar and one at the second premolar.

Agenesis can result from delayed tooth formation and eruption, or a genetically induced reduction associated with phylogenetic shortening of the tooth row (LaVelle and Moore 1972). Delayed eruption was noted in three instances; however, this was not the case for the nine individuals in which no unerupted tooth or alveolus was present. In all cases congenital agenesis involved the premolars. Hall (1940:118) stated, "when a premolar is missing the place most often is at the anterior end of the premolar series." This was the situation in only 5 of 9 individuals (55.6%) in our sample; the remainder involved the second premolar.

Supernumerary teeth were found in 8 (3.9%) of our specimens. Seven cases occurred near the first upper premolar; one was posterior to the last upper molar. X-rays revealed distinct alveoli for three of the supernumerary premolars and the molar. In the other four cases, two teeth appeared to protrude from the same alveolus, although this was difficult to verify. Previous explanations for supernumerary dentition include: 1) splitting of a permanent or milk tooth bud; 2) failure to shed deciduous teeth; 3) atavism; and 4) "arising of tooth as a new creature (genetic conditioning possible)" (Pavlinov 1975:516). We regard the latter as the least probable. Splitting of the tooth bud is a reasonable explanation in the four examples of two teeth, virtually identical in size, protruding from the same alveolus (Fig. 7).

To attribute supernumerary upper premolars in the river otter to atavism is unreasonable. The resulting five premolars exceeds the primitive number of four — already present in the normal upper premolar complement of the genus. The supernumerary premolars with distinct alveoli, therefore, are more likely due to failure of the deciduous teeth to shed. However, atavism is a likely explanation regarding the supernumerary molar. Because teeth tend to be lost at the end of a row (Hall

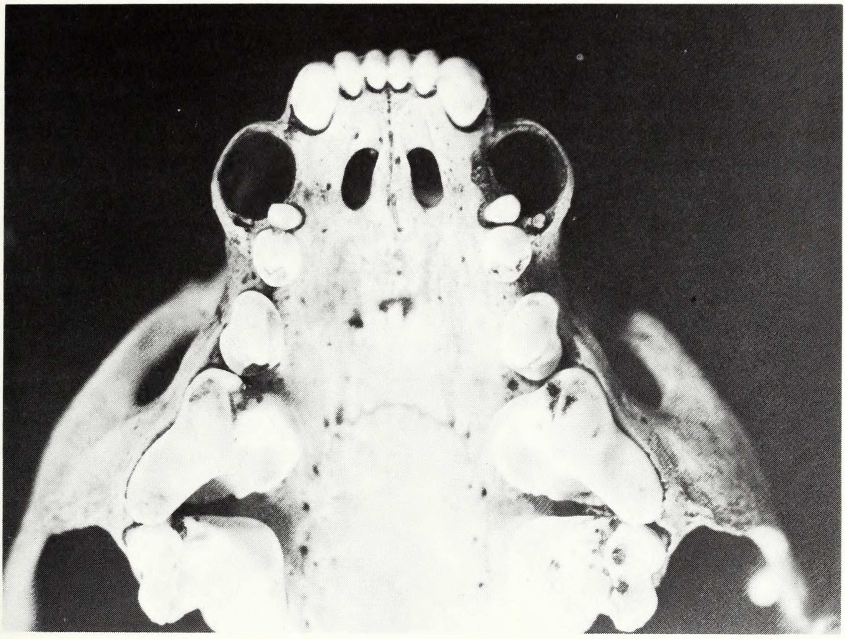

Fig. 3. Irregular spacing of dentition in immature female river otter (AEL-304).

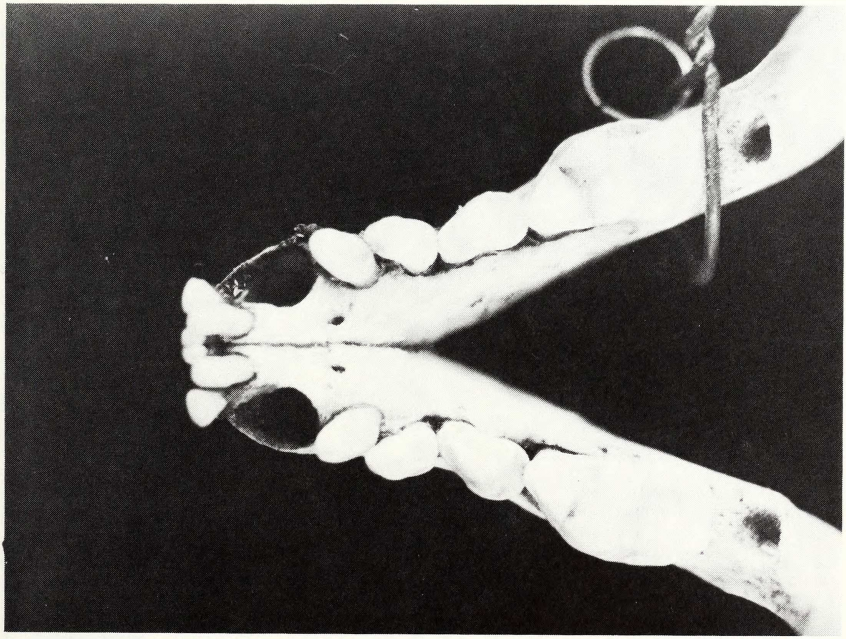

Fig. 4. Irregular tooth placement resulting in rotation from the toothrow (AEL-305).

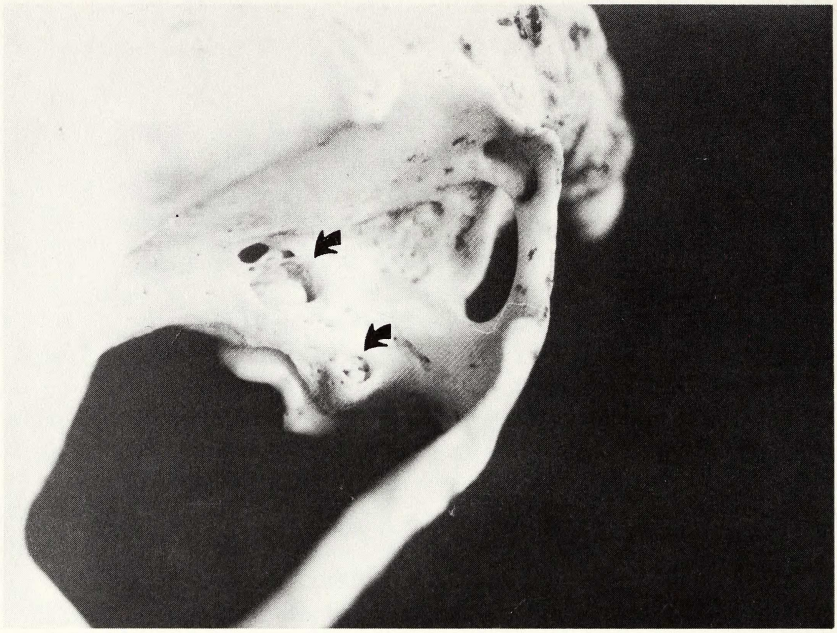

Fig. 5. Extreme alveolar thinning associated with upper molars (AEL-306).

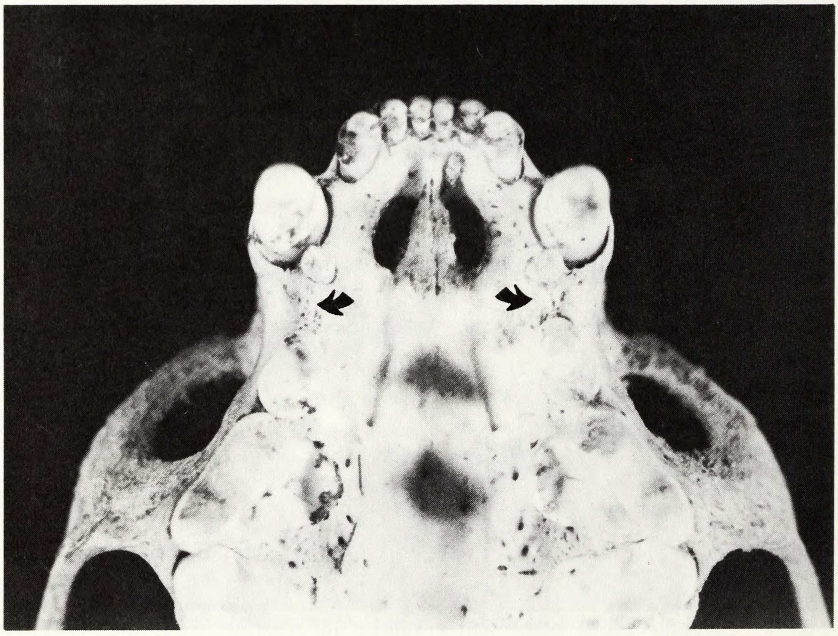

Fig. 6. Bilateral congenital agenesis of second upper premolars (AEL-307).

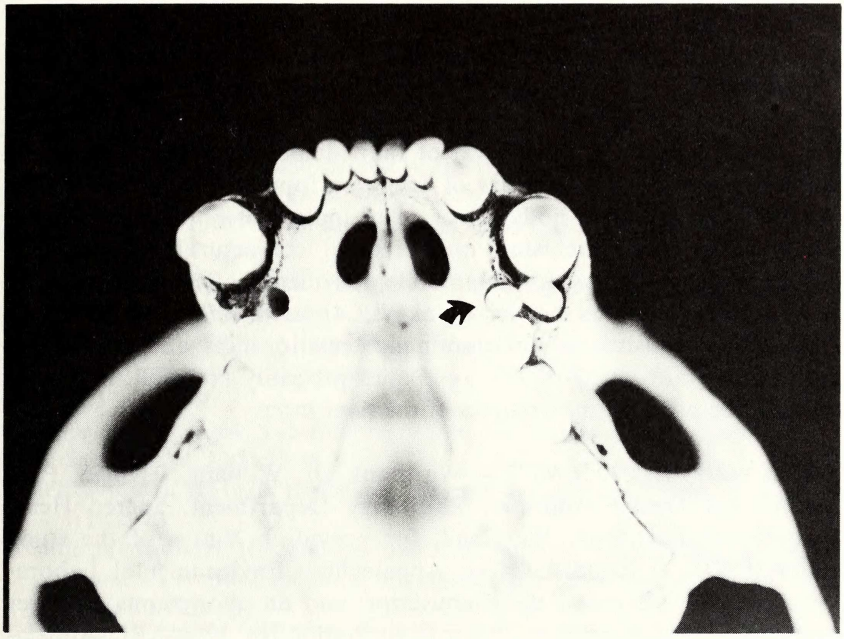

Fig. 7. Two teeth protruding from same alveolus. Apparent difference in length due to one tooth partially forced from alveolus (AEL-308).

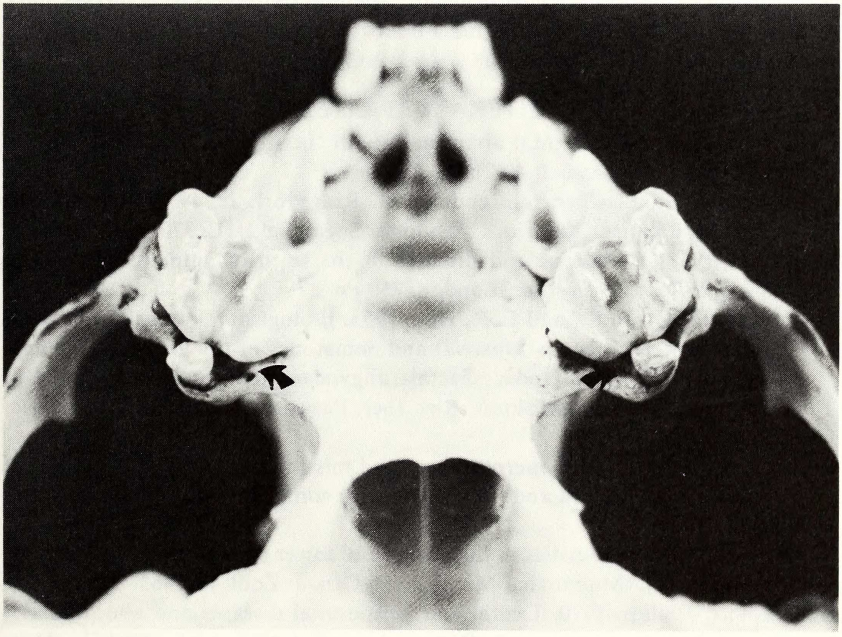

Fig. 8. Supernumerary molar assumed to be atavistic (AEL-309).

1940), placement of the extra molar at the posterior end of the series (Fig. 8) would be expected if the condition were an atavistic trait.

Based solely on the age of certain anomalous skulls, dental and cranial anomalies in the river otter did not appear to be detrimental to the overall condition or survival of individuals. As noted, anomalous animals more than three years of age were found. The carcasses were not available to assess body fat or other indices of physical condition, however, so this conclusion must remain conjectural. We suspect, though, that in contrast to the possible detrimental effects of anomalies on individual mantled howler monkeys, *Alouatta palliata*, and subsequent effects postulated for dominance relationships and population dynamics (Smith et al. 1977), anomalies probably are of little importance in the population dynamics of the river otter.

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